

1 What is claimed is:

2 1. An airbag door system having an airbag door portion and a trim member  
3 portion, said airbag door system comprising:

4 a substrate comprising a substrate upper surface, a substrate lower surface, a  
5 substrate thickness and a substrate line of mechanical weakness, said substrate line of  
6 mechanical weakness comprising at least one substrate aperture at least partially  
7 separating said substrate into an airbag door substrate portion and a trim member  
8 substrate portion;

9 an outer shell comprising an outer shell upper surface, an outer shell lower  
10 surface, an outer shell thickness and an outer shell line of mechanical weakness, said  
11 outer shell line of mechanical weakness comprising an outer shell reduced thickness  
12 portion defined by an outer shell sever extending partially through said outer shell  
13 thickness from said outer shell lower surface towards said outer shell upper surface, said  
14 outer shell line of mechanical weakness at least partially separating said outer shell into  
15 an airbag door outer shell portion and a trim member outer shell portion;

16 a foam disposed between said substrate and said outer shell, said foam  
17 comprising a foam upper surface, a foam lower surface, a foam thickness and a foam line  
18 of mechanical weakness, said foam line of mechanical weakness comprising a foam  
19 reduced thickness portion defined by a foam sever extending partially through said foam  
20 thickness from said foam lower surface towards said foam upper surface, said foam line  
21 of mechanical weakness at least partially separating said foam into an airbag door foam  
22 portion and a trim member foam portion;

1        said outer shell line of mechanical weakness comprising a line of mechanical  
2        weakness being laterally displaced by at least 3.0 millimeter relative to said foam line of  
3        mechanical weakness or said substrate line of mechanical weakness; and wherein said  
4        outer shell sever comprises first and second outer shell sever surfaces, said outer shell  
5        sever sufficiently narrow such that at least a portion of said first and second outer shell  
6        sever surfaces are in direct contact with one another after said outer shell sever is formed.

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8        2.        The outer shell sever of claim 1 wherein said outer shell sever comprises  
9        first and second outer shell sever surfaces, said outer shell sever sufficiently narrow such  
10       that at least a portion of said first and second outer shell sever surfaces are in direct  
11       contact with one another after said foam is formed.

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13       3.        The outer shell sever of claim 1 wherein said outer shell sever comprises  
14       first and second outer shell sever surfaces, said outer shell sever sufficiently narrow such  
15       that said foam does not occupy at least a portion of said outer shell sever.

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17       4.        The outer shell sever of claim 1 wherein said outer shell sever is  
18       continuous.

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20       5.        The outer shell sever of claim 1 wherein said outer shell sever is  
21       discontinuous.

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23       6.        The outer shell sever of claim 1 wherein said outer shell sever comprises  
24       an outer shell sever depth, said outer shell sever depth between 5% and 95% of said outer  
25       shell thickness.

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2           7.     The foam sever of claim 1 wherein said foam sever comprises first and  
3 second foam sever surfaces, said foam sever sufficiently narrow such that at least a  
4 portion of said first and second foam sever surfaces are in direct contact with one another  
5 after said foam sever is formed.

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7           8.     The foam sever of claim 1 wherein said foam sever is continuous.

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9           9.     The foam sever of claim 1 wherein said foam sever is discontinuous.

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11           10.    The foam sever of claim 1 wherein said foam sever is perpendicular to  
12 said foam lower surface.

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14           11.    The foam sever of claim 1 wherein said foam sever is not perpendicular to  
15 said foam lower surface.

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17           12.    The foam sever of claim 1 wherein said foam sever comprises a foam  
18 sever depth, said foam sever depth between 12.5% and 96.7% of said foam thickness.

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20           13.    The substrate aperture of claim 1 wherein said substrate aperture  
21 comprises a substrate aperture length and a substrate aperture width, said substrate  
22 aperture length is greater than said substrate aperture width.

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24           14.    The substrate aperture of claim 13 wherein said substrate aperture  
25 comprises a substrate aperture length and a substrate aperture width, said substrate  
26 aperture length is greater than or equal to four times said substrate aperture width.

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28           15.    The substrate aperture of claim 1 wherein said substrate aperture  
29 comprises a rectangle shape.

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16 The substrate aperture of claim 1 wherein said substrate aperture comprises an oval shape.

17. The substrate aperture of claim 1 wherein said substrate aperture comprises a hexagon shape.

18. The substrate aperture of claim 1 wherein said substrate aperture comprises a trapezoid shape.

19. The substrate aperture of claim 1 wherein said substrate aperture terminates in a tear stop.

20. The airbag door substrate portion and trim member substrate portion of claim 1 wherein said airbag door substrate portion and trim member substrate portion are linked by at least one substrate bridge.

21. The substrate bridge of claim 20 wherein said substrate bridge is formed at the same time and from the same material as said airbag door substrate portion or said trim member substrate portion.

22. The substrate bridge of claim 20 wherein said substrate bridge reduces independent movement of said airbag door substrate portion relative to said trim member substrate portion prior to an airbag deployment.

23. The substrate bridge of claim 20 wherein said substrate bridge breaks during an airbag deployment to permit said airbag door substrate portion to move independent of said trim member substrate portion.

1           24. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
2 substrate bridge length, said substrate bridge length no greater than 10.0mm.  
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4           25. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
5 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
6 bridge cross-sectional thickness across said substrate bridge width is constant.  
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8           26. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
9 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
10 bridge cross-sectional thickness across said substrate bridge width is variable.  
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12           27. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
13 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
14 bridge cross-sectional thickness across said substrate bridge width is equal to or less than  
15 said substrate thickness of said airbag door substrate portion or said trim member  
16 substrate portion.  
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18           28. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
19 substrate bridge edge, said substrate bridge edge is inwardly U-shaped.  
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21           29. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
22 substrate bridge edge, said substrate bridge edge is inwardly V-shaped.  
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24           30. The V-shaped substrate bridge edge of claim 29 wherein said V-shaped  
25 substrate bridge edge is off-centered V-shaped.  
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27           31. The substrate bridge of claim 20 wherein said substrate bridge comprises a  
28 substrate bridge containing an aperture.  
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1        32.    The substrate bridge of claim 31 wherein said aperture is of triangular  
2    shape, oval shape, octagonal shape, circular shape or trapezoidal shape.

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4        33.    The substrate bridge of claim 31 wherein said aperture is center bored.

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6        34.    The substrate bridge of claim 31 wherein the aperture is the aperture  
7    comprises an opening and a portion of said opening is not contained within the substrate  
8    bridge.

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10       35.    An airbag door system having an airbag door portion and a trim member  
11    portion, said airbag door system comprising:

12          a substrate comprising a substrate upper surface, a substrate lower surface, a  
13    substrate thickness and a substrate line of mechanical weakness, said substrate line of  
14    mechanical weakness comprising at least one substrate aperture at least partially  
15    separating said substrate into an airbag door substrate portion and a trim member  
16    substrate portion;

17          an outer shell comprising an outer shell upper surface, an outer shell lower  
18    surface, an outer shell thickness and an outer shell line of mechanical weakness, said  
19    outer shell line of mechanical weakness comprising an outer shell reduced thickness  
20    portion defined by an outer shell sever extending partially through said outer shell  
21    thickness from said outer shell lower surface towards said outer shell upper surface, said  
22    outer shell line of mechanical weakness at least partially separating said outer shell into  
23    an airbag door shell portion and a trim member outer shell portion;

24          a foam disposed between said substrate and said outer shell, said foam  
25    comprising a foam upper surface, a foam lower surface, a foam thickness and a foam line  
26    of mechanical weakness, said foam line of mechanical weakness comprising a foam  
27    reduced thickness portion defined by a foam sever extending partially through said foam  
28    thickness from said foam lower surface towards said foam upper surface, said foam line  
29    of mechanical weakness at least partially separating said foam into an airbag door foam

1 portion and a trim member foam portion;

2 said outer shell sever at said outer shell lower surface in direct contact with said  
3 foam upper surface wherein said outer shell sever comprises first and second outer shell  
4 sever surfaces such that at least a portion of said first and second outer shell sever  
5 surfaces are in contact with one another after said outer shell sever is formed.

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7 36. The outer shell sever of claim 35 wherein said outer shell sever comprises  
8 first and second outer shell sever surfaces, said outer shell sever sufficiently narrow such  
9 that at least a portion of said first and second outer shell sever surfaces are in direct  
10 contact with one another after said outer shell sever is formed.

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12 37. The outer shell sever of claim 35 wherein said outer shell sever comprises  
13 first and second outer shell sever surfaces, said outer shell sever sufficiently narrow such  
14 that at least a portion of said first and second outer shell sever surfaces are in direct  
15 contact with one another after said foam is formed.

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17 38. The outer shell sever of claim 35 wherein said outer shell sever comprises  
18 first and second outer shell sever surfaces, said outer shell sever sufficiently narrow such  
19 that said foam does not occupy at least a portion of said outer shell sever.

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21 39. The outer shell sever of claim 35 wherein said outer shell sever is  
22 continuous.

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24 40. The outer shell sever of claim 35 wherein said outer shell sever is  
25 discontinuous.

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27 41. The outer shell sever of claim 35 wherein said outer shell sever comprises  
28 an outer shell sever depth, said outer shell sever depth between 5% and 95% of said outer  
29 shell thickness.

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2           42.    The foam sever of claim 35 wherein said foam sever comprises first and  
3   second foam sever surfaces, said foam sever sufficiently narrow such that at least a  
4   portion of said first and second foam sever surfaces are in direct contact with one another  
5   after said foam sever is formed.  
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7           43     The foam sever of claim 35 wherein said foam sever is continuous.  
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9           44.    The foam sever of claim 35 wherein said foam sever is discontinuous.  
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11          45.    The foam sever of claim 35 wherein said foam sever is perpendicular to  
12   said foam lower surface.  
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14          46.    The foam sever of claim 35 wherein said foam sever is not perpendicular  
15   to said foam lower surface.  
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17          47.    The foam sever of claim 35 wherein said foam sever comprises a foam sever  
18   depth, said foam sever depth between 12.5% and 96.7% of said foam thickness.  
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20          48.    The substrate aperture of claim 35 wherein said substrate aperture  
21   comprises a substrate aperture length and a substrate aperture width, said substrate  
22   aperture length is greater than said substrate aperture width.  
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24          49.    The substrate aperture of claim 48 wherein said substrate aperture length  
25   is greater than or equal to four times said substrate aperture width.  
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27          50.    The substrate aperture of claim 35 wherein said substrate aperture  
28   comprises a rectangle shape.  
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1           51.    The substrate aperture of claim 35 wherein said substrate aperture  
2 comprises an oval shape.

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4           52.    The substrate aperture of claim 35 wherein said substrate aperture  
5 comprises a hexagon shape.

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7           53.    The substrate aperture of claim 35 wherein said substrate aperture  
8 comprises a trapezoid shape.

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10          54.    The substrate aperture of claim 35 wherein said substrate aperture  
11 terminates in a tear stop.

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13          55.    The airbag door substrate portion and trim member substrate portion of  
14 claim 35 wherein said airbag door substrate portion and trim member substrate portion  
15 are linked by at least one substrate bridge.

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17          56.    The substrate bridge of claim 55 wherein said substrate bridge is formed at  
18 the same time and from the same material as said airbag door substrate portion or said  
19 trim member substrate portion.

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21          57.    The substrate bridge of claim 55 wherein said substrate bridge reduces  
22 independent movement of said airbag door substrate portion relative to said trim member  
23 substrate portion prior to an airbag deployment.

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25          58.    The substrate bridge of claim 55 wherein said substrate bridge breaks  
26 during an airbag deployment to permit said airbag door substrate portion to move  
27 independent of said trim member substrate portion.

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29          59.    The substrate bridge of claim 55 wherein said substrate bridge comprises a

1 substrate bridge length, said substrate bridge length no greater than 10.0mm.  
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3 60. The substrate bridge of claim 55 wherein said substrate bridge comprises a  
4 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
5 bridge cross-sectional thickness across said substrate bridge width is constant.  
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7 61. The substrate bridge of claim 55 wherein said substrate bridge comprises a  
8 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
9 bridge cross-sectional thickness across said substrate bridge width is variable.  
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11 62. The substrate bridge of claim 55 wherein said substrate bridge comprises a  
12 substrate bridge cross-sectional thickness and a substrate bridge width, said substrate  
13 bridge cross-sectional thickness across said substrate bridge width is equal to or less than  
14 said substrate thickness of said airbag door substrate portion or said trim member  
15 substrate portion.  
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17 63. The substrate bridge of claim 55 wherein said substrate bridge comprises a  
18 substrate bridge edge that is inwardly U-shaped.  
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20 64. The substrate bridge of claim 55 wherein said substrate bridge comprises  
21 a substrate bridge edge that is inwardly V-shaped.  
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23 65. The V-shaped substrate bridge edge of claim 64 wherein said inwardly V-  
24 shaped substrate bridge edge is off-centered.  
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26 66. The substrate bridge of claim 55 wherein said substrate bridge comprises a  
27 substrate bridge containing an aperture.  
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29 67. The substrate bridge of claim 55 wherein said aperture is of triangular

1 shape, oval shape, octagonal shape, circular shape or trapezoidal shape.  
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3 68. The substrate bridge of claim 55 wherein said aperture is center bored.  
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5 69. The substrate bridge of claim 55 wherein the aperture comprises an  
6 opening and a portion of said opening is not contained within the substrate bridge.  
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8 70. An airbag door system comprising an airbag door portion and a trim  
9 member portion comprising a substrate comprising a substrate upper surface, a substrate  
10 lower surface, a substrate thickness and a substrate line of mechanical weakness, said  
11 substrate line of mechanical weakness comprising at least one substrate aperture at least  
12 partially separating said substrate into an airbag door substrate portion and trim member  
13 substrate portion, wherein said airbag door substrate portion and trim member substrate  
14 portion define a substrate bridge wherein said substrate bridge contains an aperture.  
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16 71. The airbag door system of claim 70 wherein said aperture is of triangular  
17 shape, oval shape, octagonal shape, circular shape, trapezoidal shape, or mixture thereof.  
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19 72. The airbag door system of claim 70 wherein said aperture is center bored.  
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21 73. The airbag door system of claim 70 wherein the aperture comprises an  
22 opening and a portion of said opening is not contained within the substrate bridge.  
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